Senior High School

CURRICULUM GUIDE

for

# INDUSTRIAL ARTS MATERIALS 10, 20, 30

(Interim Edition)

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Province of Alberta

Department of Education

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TABLE OF CONTENTS


| | Page No. |
|---|---|
| Industrial Arts Materials 10 | 8 |
| References for Industrial Arts Materials 10 | 28 |
| Industrial Arts Materials 20 | 34 |
| References for Industrial Arts Materials 20 | 42 |
| Industrial Arts Materials 30 | 45 |
| References for Industrial Arts Materials 30 | 55 |

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# INDUSTRIAL ARTS MATERIALS

## Introduction

The public school must provide an opportunity for students to become not only acquainted with industrial processes and the social economic problems resulting but to include a wide range of experiences, particularly in the material changes which have and do occur. This is quite evident if people are to participate intelligently in programs dealing with the social control of the industrial structure.

If all students are to become acquainted with this complex industrial environment the school should provide a program to fill this need.

The basic idea in the Materials courses is to provide the student with a range of experiences, using tools, materials and processes, as well as teaching organized informational content in certain areas of industry that will enable him to understand this world of work and to become a better citizen.

## Objectives

Industrial Arts is a part of general education and as such instructors need to understand the objectives of the Alberta educational program.

## Functional Objectives of the Alberta Secondary Schools

### 1. Personal Development

The prime aim of the school is to assist each Alberta youth in his growth towards maximum self-realization. The following definite goals are included under this heading:

(a) Health and physical fitness.
(b) Mental health.
(c) Intellectual achievement.
- Ability to think rationally, to express thought clearly and to read and listen with understanding.
- A broad understanding of the methods of science, its major findings and its influence on human affairs.
- A broad understanding of the fundamental principles of mathematics and their importance in daily living; a mastery of mathematical skills necessary for vocational competence.
- An understanding and appreciation of cultural heritage.

(d) The development of suitable recreational and leisure time activities.

(e) The development of character manifested in sound habits of behavior in social relationships.

(f) The development of a pattern of values, attitudes, and ethical ideals which furnish justification for good habits and culminate in a philosophy of life which recognizes the importance of religion.

2. Growth in Family Living

Each Alberta youth must learn to appreciate the unique and indispensable place in society played by the home and family and especially the influence of the family unit upon right thinking in connection with morals, institutions, and the current issues of democratic living. The school should assist him to achieve a better understanding and appreciation of:

(a) The responsibilities and privileges of the members of the family group.

(b) The home as a democratic institution.

(c) The conditions essential to successful family life.

(d) The opportunities for enjoyment at home.

(e) The functions and responsibilities of parents.

(f) The relationship of the family to its neighbors and the community.

3. Growth Toward Competence in Citizenship

Each Alberta youth must be brought gradually to a realization of his position and responsibilities in the school, community, province, nation, and finally in the community of nations. The school should guide him in:

(a) Acquiring insight into the historical background of contemporary society.

(b) Developing competence in meeting, and attempting to solve public problems and issues which citizens are required to encounter and on which they must take action.

(c) Developing competence in political action at the school, community, national and world levels.

(d) Developing consumer competence.

(e) Developing democratic attitudes and behavior in all social situations.

(f) Establishing loyalty to the ideals of democracy and acquiring an appreciation of his community, the province and the nation.

4. Occupational Preparation

The school must help each Alberta youth to develop those understandings and attitudes that will make him an intelligent and productive participant in economic life; and assist him to develop saleable skills, or prepare for post-school vocational training. The youth should:

(a) Become familiar with the range of vocational opportunities open to him.

(b) Learn how to take full advantage of the school and extra-school guidance services.

(c) Achieve an acceptance of his own capacities as indicated by professional analysis of interests, socio-economic status, aptitudes, personality, and native intelligence.

## Objectives Of The Senior High School Industrial Arts Program

The Industrial Arts program helps to attain the functional objectives of Alberta Secondary School Education as set forth above.

Within the scope of these general objectives the unique contributions made possible through Industrial Arts courses are summed up in the following objectives:

Industrial Arts courses will provide an opportunity for students:

1. To develop an understanding of related technological clusters and the inter-relationship of the technologies within the cluster areas.
2. To develop an understanding of the applications of the academic disciplines in an industrial environment.
3. To study and work in an environment which stimulates the individual to discover and develop his interests and talents.
4. To develop an understanding of man's changing role in an advancing industrialized society.

## Specific Objectives For Industrial Materials

1. To develop an understanding of processes and techniques as applied to these materials.
2. To develop knowledge of the tools and equipment used.
3. To develop knowledge of the materials, their sources and applications.
4. To aquaint students with job opportunities.

5. To develop safe habits in the handling of tools, materials and equipment.

6. To develop an understanding of the inter-relationship of materials, construction and design.

7. Develop an understanding of the social and industrial aspects of industry.

Course Organization

This course offers students the opportunity to work with a number of different materials; wood, metal, plastics and a craft material. Each unit has the content organized under seven main headings:

1. Design and Layout
2. Materials
3. Hand Processes
4. Basic Machine Processes
5. Fasteners
6. Finishing
7. Occupational Information

With this type of organization of content lesson, information can be prepared to cut across the four units under each main topic. For example, when discussing layout the information can be applied to layout on all materials. Similarities and differences can be quickly pointed out. In this way most of the formal lessons can be taught to the class as a whole, while the student activities are carried out in four different areas.

The industrial arts facility for this course will be equipped to provide accommodation for activity in the three major areas. In addition one craft area for each year the course is taught should be provided for.

Activities in such a laboratory will be going on in four different areas at one time. This will require the instructor to organize course material well. He will be required to plan job, information, operation and assignment sheets as well as experiments and testing procedures.

Teaching Plan

The materials laboratory will operate on a multiple-activity basis. To make such a program successful the instructor must organize both his instructional material and the shop well. He must have a plan, carefully worked out.

The following plan is suggested as an answer to the dilemma the uninitiated teacher may find himself in first attempting to present such a program.

Prepare a series of lessons which will orient the student to the year's work. These would include information concerning:

1. regulations and general behavior

2. evaluation procedures

3. use of instructional materials - instruction sheets, tapes, slids, films, library

4. use and care of tools common to areas to be studied

5. layout procedures

6. safety education

7. prepare plans, bills of materials and procedure sheets for work to be carried out. (This should not be a drafting course)

Following this basic instruction which might take 6 - 8 sessions, the students are grouped and proceed to the special areas for unit work. The instructor will move from group to group, giving demonstrations and short information talks as needed. The remaining time the instructor will give individual help.

A definite planned program of providing new information and evaluating progress must be organized. Tests should be given when a group completes a unit and moves to a new area.

Use of Program Guides

Instructors are expected to use the course guides to ascertain the content they are to teach. Some deviations from the course will be allowed providing the instructor can justify such variation to the high school inspector or Industrial Arts Supervisor.

Administration

1. Time - Each of these courses may be offered for four-five credits. The number of minutes required per credit should conform with the regulations described in the Senior High School Handbook.

2. Scheduling - Industrial Arts courses can be satisfactorily taught in blocks of time of from 60 to 160 minutes. Double period blocks twice a week have proven very good.

3. Class Size - A maximum class size of twenty is suggested. When student numbers go beyond that, student and teacher efficiency is seriously hampered because of insufficient space and equipment. Industrial Arts laboratories in this province are not planned to cope with numbers larger than twenty.

4. Records - Every instructor should keep the following records:

   (a) Enrolment and attendance
   (b) Daily lesson plan
   (c) Yearly plan
   (d) Record of student achievement
   (e) Inventory of equipment and supplies

It is recommended that the records be kept in a simple efficient manner.

5. Student Evaluation - Evaluation must be based on what the student has learned (know) and what he has done (do). The following is a suggested criteria for grading students.

| | |
|---|---|
| Related Theory - tests, written exercises, reports (Know Column) | 50% |
| Activity - projects, experiments, operations performed (Do Column) | 50% |

Equipment

Adequate equipment should be available before the course is offered. Check with the authorized equipment lists available from your local superintendent.

Shop Safety Program

Every shop must have an effective safety program. This does not mean that the promulgation of a set of rules and regulations will satisfy this end. Students must be taught in each and every subject studies within the industrial arts framework, the "hows and whys" inherent in the safety program. It is the responsibility of the instructor to supply continuous and vigilant supervision and to ensure that all students engage in only safe shop practices. A good safety program would include:

1. regular and thorough instruction and revision.
2. constant vigilance.
3. checking and evaluating of student safety habits by the instructor.
4. complete first aid equipment kept in first-class condition.
5. non-skid paint and clearly marked working areas around all machinery.
6. proper clothing with particular attention to eye protection.
7. machines and tools in good working condition.
8. routine reporting of all accidents.
9. good housekeeping.

The following is a sample of safety regulations which the instructor might be expected to enforce:

1. No power machines shall be used by any student before specific instruction has been given with regard to safe operation and safety precautions.

2. No power machine shall be used while the instructor is absent from the shop.

3. No machine shall be used by any student unless adequately guarded.

4. Approved eye protection must be worn for certain operations.

Note: A good safety slogan which should be put into practice at all times - a place for everything and everything in its place.

There are five basic steps in safety education:

1. Set a good safety example for student.

2. Instruct each student thoroughly in the safety precautions of his job.

3. Keep all tools sharp and in good condition.

4. Keep all safety devices in proper use.

5. Follow up safety instructions constantly. The shop will be as safe as the instructor makes it.

Dress and deportment play an important part in the operation of a safe shop program. Students and instructor should be neatly dressed at all times and the instructor should take care to ensure that no loose and dangerous clothing is worn. Safety aprons, goggles, gloves, should be used wherever necessary.

It should be pointed out that failure to comply with every reasonable safety precaution, may jeopardize the instructor's position in any claim for compensation. Each school should receive the excellent publications and bulletins dealing with accident prevention and safety procedures distributed by the Workmen's Compensation Board.

Note: Accidents must be promptly reported to some senior school authority. If no other person is designated, this authority is the Principal.

# INDUSTRIAL ARTS MATERIALS 10

## Introduction

Our civilization is built upon the utilization and fabrication of materials.

Many of the comforts that we take for granted today have been made possible by materials in industry.

Herein lies the value of teaching the utilization of materials in our schools where full scope can be given to develop those qualities of initiative, experience and imagination which will open up new sources of interest and pride in achievement.

## WOOD TECHNOLOGY

## Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Layout and Design** | |
| 1. Do exercise based on blueprint reading. | 1. How to read blueprints<br>-lines and symbols<br>-types of projections |
| 2. Use measuring tools<br>-rule<br>-try square<br>-tape | 2. How to layout work in wood. |
| 3. Use a marking knife, compass, dividers and marking guage. | |
| 4. Find examples of wood products that have good design. | 4. Principles of good design<br>-balance<br>-proportion<br>-simplicity<br>-proper selection of material and finish |

| Do | Know |
|---|---|
| **Source and Applications** | |
| 5. Write out characteristics, source and best use of a number of selected woods.<br>(a) Make tests comparing strengths of various woods. | 5. Identification of common woods.<br>-pine<br>-fir<br>-poplar<br>-maple<br>-birch<br>-mahogany<br>-walnut<br>-ash<br>-willow<br>-red gum<br>-cedar |
| **Hand Processes** | |
| 6. Condition a jackplane<br>-sharpen blade<br>-tighten handles<br>-adjust frog | 6. Care of edge tools<br>-personal safety<br>-protection of cutting edges<br>-prevention of breakage<br>-tool conditioning |
| 7. Sharpen a chisel. | |
| 8. Sharpen a bit. | |
| 9. Tighten handle on a saw. | |
| 10. Cut with a crosscut. | 10. How to select and care for sawing tools (crosscut, rip, keyhole, coping, back). |
| 11. Cut with a ripsaw. | |
| 12. Cut with a backsaw. | |
| 13. Adjust plane | 13. How to select and use bench planes. |
| 14. Plane faces. | |
| 15. Plane an edge. | |
| 16. Plane an end. | |

| Do | Know |
|---|---|
| 17. Square a board. | |
| 18. Plane a chamfer. | |
| 19. Plane a bevel. | |
| 20. Pare with a chisel. | 20. How to select and use a chisel. |
| 21. Bore vertical and horizontal holes. | 21. How to select and use boring tools. |
| 22. Bore a hole to depth. | |
| 23. Cut with a coping or jig saw. | 23. How to select and use tools to cut odd shapes. |
| 24. Use a spakeshave to smooth inside curves and convex edges. | |
| 25. Sand flat surfaces. | |
| 26. Grind a chisel. | 26. How to use the grind stone<br>-types of stones<br>-speeds<br>-cooling |
| **Machine Processes** | |
| 27. Use a band saw to cut curves in heavy stock. | 27. Select and use abrasive papers<br>-garnett<br>-flint<br>-grit sizes<br>-sanding blocks |
| 28. Turn a face plate project using correct chisels. | 28. How to use the lathe for<br>-faceplate and spindle turning<br>-speeds<br>-use of chisels<br>-safety precautions |
| 29. Rip with the circular saw. | 29. How to use the circular saw for ripping and crosscut.<br>-use of guards<br>-safety precautions |

| Do | Know |
|---|---|
| 30. Crosscut with the circular saw. | |
| 31. Edge plane a board. | 31. How to use the jointer.<br>-surface plane<br>-edge plane<br>-safety precautions |
| 32. Surface plane a board. | |
| **Fasteners** | |
| 33. Fasten material with glue. | 33. How to select and use fasteners.<br>-glues-kinds, uses<br>-screws-types, sizes<br>-nails-types, sizes |
| 34. Test glue strength. | |
| 35. Drive and set a nail. | |
| 36. Drive a screw. | |
| **Finishing** | |
| 37. Apply wood filler | 37. Common wood finishes. |
| 38. Apply sealer | |
| 39. Apply oil finish | |
| 40. Apply varnish finish. | |
| 41. Apply wax. | |
| 42. Polish a finish. | |
| **Occupational Information** | |
| 43. Study your community and name all the people you know doing work that requires the skills of a carpenter. | 43. Vocational areas related to woodworking. |

Sources

Fyfe Smith - Edmonton and Calgary

# METAL

Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Blueprint Reading - Layout & Design** | |
| 1. Sketch project | 1. Understanding a working drawing. |
| 2. Dimension. | |
| 3. Make material list. | |
| 4. Layout project. | 4. How to mask metal -procedure steps |
| | 5. Function and design from materials aspect. |
| **Materials, Sources & Application** | |
| | 6. The history of metals leading to the development of iron and steel. |
| 7. Examine types of iron ore, coke, and limestone. | 7. The iron ores - Hematite, Magnetite, Limonite, Taconite and their composition.<br>World distribution.<br>Methods of mining.<br>Transport.<br>Refinement - Screening, Washing, Calcining, Sintering, Flotation. |
| 8. Take a piece of pig-iron or cast-iron. Break, file, polish, etch and examine under a microscope. | 8. The Blast Furnace - History, construction and operation.<br>Pig-iron and its constitution.<br>Crystal formation of pig-iron.<br>Slag and its uses or disposal.<br>The cupola furnace and the production of cast iron.<br>Cast iron techniques. |

| Do | Know |
|---|---|
| 9. Cut a piece of wrought iron - if available - and mild steel, polish and observe under the microscope. | 9. Refining pig-iron<br>The puddling furnace.<br>Seimens open Hearth Regenerative Furnace.<br>Bessemer Converter.<br>Crucible Furnace.<br>Electric Arc and Induction Furnaces.<br>Construction, Operation and Products of these furnaces.<br>Methods of producing rods, bars, strips, sheet, tubes and wire, both hot and cold. |
| **Hand Processes** | |
| 10. Lay out patterns on sheet metal and bar stock using<br>-steel square<br>-steel rule<br>-scriber<br>-divider<br>-trammel points<br>-hemaprodite calipers<br>-marking ink | 10. Layout procedures and tools. |
| 11. Make sheet metal joints and seams. | 11. How to use and care for hand tools. |
| 12. Use setting hammer. | |
| 13. Use hacksaw to square stock. | 13. How to use the hacksaw<br>-blades |
| 14. File metal to line. | 14. How to use files<br>-kinds<br>-cuts<br>-care |
| 15. Drill a hole in metal with a hand drill. | 15. Use and care of hand drills<br>-sizes<br>-damping |
| 16. Fold, bend and bun metal. | 16. How to shape metal using stakes. |
| 17. Punch hole in sheet metal with a chassis punch. | 17. Use and care of chassis punch. |

| Do | Know |
|---|---|
| **Fasteners** | |
| 18. Prepare metal for rivetting. | 18. Kinds of fasteners and uses.<br>-rivets<br>-machine screws<br>-bolts, etc. |
| 19. Use a rivet set. | 19. Techniques of rivetting. |
| | 20. Types - tin, lead content |
| 21. Soft solder tin plate. | 21. How to solder. |
| 22. Tin a soldering copper. | |
| | 23. Types of fluxes. |
| 24. Use bolts to fasten metal parts. | 24. Use of bolts - common types N.C. N.F. |
| 25. Cut threads with a die. | 25. How to use a tap and die set. |
| **Machine Processes** | |
| 26. Drill holes in metal with high-speed and carbon drills. | 26. How to use the drill press.<br>-speeds - clamping |
| 27. Sharpen a drill. | 27. Types and uses of drills<br>-sizes<br>-sharpening<br>-clearance |
| 28. Grind metal for welding. | 28. How to use the grinder<br>-types of stones<br>-safety precautions |
| **Occupational Information** | |
| 29. Make a study of one firm that fabricates metal projects to discover skills and training required. | 29. Occupations dealing with metal work. |
| **Finishing** | |
| 30. Applying metal finishes<br>-prepare surface<br>-apply primer<br>-apply paint | 30. Types of finishes and their application. |

# PLASTICS

## Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Layout & Design** | |
| 1. Choose projects using acrylics and butyrates. | 1. (a) History of acrylics and butyrates<br>(b) Terminology used in plastics |
| 2. Interpret drawings. | 2. Basic reasons for design. |
| **Materials, Source & Application** | |
| 3. Identify; acrylics, vinyls, butyrates. | 3. (a) Classification of plastics<br>(b) Sources of plastics |
| 4. Layout work on plastic. | 4. Methods of layout on plastic. |
| 5. Care for hand tools used on plastics. | 5. Types and uses of hand tools for plastics. |
| 6. Cut out stock. | 6. Tools and methods for cutting plastics. |
| 7. Square stock. | 7. Procedure for squaring stock. |
| 8. File plastic. | 8. Care and types of files used for acrylics.<br>-kinds<br>-cuts<br>-care |
| **Machine Processes** | |
| 9. Drill plastics. | 9. Types and care of drills used for plastics.<br>-size<br>-clearance<br>-sharpening |
| 10. Cut plastics with band and jig saws. | 10. (a) safe operation of power tools used on plastics<br>(b) power tools used on plastics |

| Do | Know |
|---|---|
| 11. Shape plastics with lathe. | 11. How to care for and adjust power tools used for acrylics. |
| 12. Sand plastics. | 12. Types and uses of sandpaper for plastics. |
| 13. Bend acrylics with heat. | 13. How to heat plastics for bending. |
| **Fasteners** | |
| 14. Join plastic with cements. | 14. Types and application of plastic cements. |
| 15. Join plastic with solvents. | 15. Types and application of plastic solvents. |
| 16. Join plastics mechanically. | 16. Mechanical fasteners for plastics. |
| **Finishing** | |
| 17. Inlay plastics. | 17. Differences between inlay and overlay. |
| 18. Overlay plastics. | |
| 19. Color plastics. | 19. Methods of coloring plastics. |
| 20. Buff plastics. | 20. Methods of buffing plastics |
| 21. Polish plastics. | 21. Polishes and methods of polishing plastics. |
| 22. Experimentation and testing of plastic. | 22. Safe techniques of working with acrylics. |
| **Occupational Information** | |
| 23. Report on place of plastics in industry today. | 23. (a) Plastics used in industry<br>(b) Fields of employment in plastic industries. |

Projects

| | | |
|---|---|---|
| 1. Various pulls | 5. Jewelry | 9. Candle holders |
| 2. Keychain ornaments | 6. Tie clasps | 10. Cigarette boxes |
| 3. Letter openers | 7. Picture frames | 11. Jewelry boxes |
| 4. Dress clips | 8. Bracelets | 12. Letter holders |

# INDUSTRIAL CRAFTS

## Introduction

There are five craft material areas from which one should be chosen each year of the program. The order of selection is left to the discretion of the teacher.

The craft materials are:

A. Leather
B. Textiles
C. Ceramics
D. Lapidary
E. Art Metal

## A. LEATHER

### Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Layout & Design** | |
| 1. Prepare a design for a project. | 1. How to design in leather. |
| **Materials** | |
| 2. Select leather for project. | 2. Kinds and uses of leather. |
| 3. Layout and cut leather. | 3. Methods used for laying out and cutting leather. |
| 4. Moisten leather | 4. Preparation of leather for tooling and carving. |
| **Hand Processes** | |
| 5. Condition sharper and store tools | 5. Care of tools. |
| 6. Transfer design to leather. | 6. Various ways to transfer designs to leather. |
| 7. Use a swivel knife to carve. | 7. Methods of using the swivel knife. |

| Do | Know |
|---|---|
| 8. Follow tool sequences<br>(a) cutting<br>(b) beveling<br>(c) background | 8. The proper tool sequences. |
| 9. Use edge creaser. | 9. How to do edge creasing. |
| 10. Skive leather. | 10. Why and how to skive. |
| **Fasteners** | |
| 11. Lace using the double button hole stitch. | 11. Types of lacing. |
| 12. Sew leather. | 12. How to fasten parts<br>-sewing<br>-rivets<br>-glues<br>-snaps |
| 13. Cement leather. | |
| 14. Use rivets.. | |
| 15. Use snap fasteners. | |
| **Finishes** | |
| 16. Finish with<br>(a) dyes<br>(b) liquid wax<br>(c) leather sealer<br>(d) oil | 16. Application of finishes. |
| 17. Clean leather articles. | 17. Correct care of leather articles. |
| **Occupational Information** | |
| 18. Write a report on a leather industry in Alberta.<br>e.g. shoe factory in Edson<br>saddlery in High River | 18. What leather industries there are in Alberta and Canada. |

Projects

Billfolds, belts, handbags, etc.

## B. Textiles

### Introduction

The study of textiles will give an intelligent appraisal of standards and brands of merchandise, an ability to distinguish quality in fabric and the proper use of different qualities.

The history and cultural association as well as the handling of fabrics becomes a fascinating study from the source of raw materials, to the way these basic materials are processed, and the way products are designed and distributed.

As a result of this study, the consumer merchant and the consumer customer will know how to buy and what to buy. It is important that students have fabrics to handle and compare.

### Objectives

1. Develop interest in textiles.
2. Develop a knowledge of (a) natural fibers, (b) man-made fibers, (c) synthetic fibers.
3. Acquaint student with modern equipment - operation and simple service of each.
4. Give some understanding of the numerous fabrics on the market today and the performance of the particular fabric in this ever-changing picture.

### Course Content

What the student should be able to:

| Do | Know |
|---|---|
| 1. Use a microscope or linen picker. | 1. Characteristics of fiber, yarn and fabric. |
| 2. Tests for burning, feeling, breaking and chemical test if possible. Collect labels for synthetics. | 2. Identification of natural fibers and some man-made fibers. |
| 3. Yarn count and twist of yarn. | 3. The ply of yarn needed. |
| 4. Be able to weave a mat to illustrate plain, twill and satin weave. | 4. Know the materials directed to these weaves and why. |

| Do | Know |
| --- | --- |
| 5. Bleach and shrink material. Collect samples of each process. | 5. Know the finishes and processes used in crabbing, fulling, weighting, napping, and shearing. Crease resistance, water repellency and moth proofing. |
| 6. Dyeing cottions and removing color from fabrics. Dyeing wool. | 6. How these are used and type of decoration and color design for each. |
| 7. Test wool, strength, heat conductivity absorption, shrinkage, cleanliness, washability, fastness to color, reaction to acid and alkali. | 7. Record results of tests. |
| 8. Man made fiber. Collect samples also blends and mixtures. | 8. Advantages of man-made and combination fibers. |
| 9. Synthetics made from elements; carbon, air, water. | 9. Prospective uses. Samples. |
| 10. Collect samples of materials and pictures from stores, tailors and catalogs. | 10. The kind of clothes you need for school, social, sports. |
| 11. Try a variety of products and practice a few grooming techniques. Hand care, shoe care, mend and press clothes. | 11. Good grooming habits and products on the market to help clean, deodorize and keep you well groomed. |
| 12. Study C.A.C. and apply and compare stores and catalog standards. | 12. How to buy and what to buy. |
| 13. Service sewing machine, thread machine, learn parts by using. Sew at least two articles in suggested list. | 13. Operation and care of sewing machine and pressing equipment. |
| 14. Plan budget and list clothes needed. | 14. Value of clothing dollar. |
| 15. List local firms working with textiles and employment opportunities. | 15. Employment opportunities.<br>(a) automobile industry - upholstery<br>(b) home furnishing<br>(c) interior decorating<br>(d) mercantile field of buying |

| Do | Know |
|---|---|
| | 15. (d) Cont.: and selling - managers, buyers, shop operators, specialist shops, ready to wear, yard goods and notions.<br>(e) drapery<br>(f) tailoring<br>(g) repair and mending in laundry and hospitals.<br>(h) inventing and processing materials from raw materials to fiber and fabrics. |

Activities in Connection with Textiles

1. Smock or cook's apron and cook's cap; cover for a chair or stool.

2. Pot holder, tea towel. Brands painted or sewn on. Make a dress or sports shirt, felt or suede vests.

3. Hand painted tie, or pillow cover.

4. Game bag or beach bag with snap flap. Money belt or gun shell carrier.

5. Operation of sewing machine, washing machine.

6. Launder socks and sweater. Iron and fold dress shirt. Patch pants.

7. Prepare booklets on fibers -- natural, man made, synthetics. Collect samples and tags and labels from ready made clothes and yard goods.

8. Make occupation charts. Have guest speakers or visit clothing factory.

9. Make and use press equipment.

10. Samples 7" by 5" may be made to illustrate the following;

| | | |
|---|---|---|
| Grain line | seam grading | marking with tracing wheel |
| Baste stitch | hand and machine | tailor tacks |
| Regulation stitching | gather stitch | stay stitch |
| Clean finishing | trimming, clipping | understitching |
| Darts | bias strip | directional stitching |
| Thread loops | hook and eye | button stitch |
| Seams | plain | flat feld |
| Zipper | | |
| Seam finishes | pinking | overcasting |
| Edge turned and stitched | | |

## C. CERAMICS

### Introduction

Ceramics is one of the oldest crafts known to mankind. There are many references to the making of ceramics in ancient literature as well as in the Bible. It remains one of the outstanding industrial enterprises in this modern technological world. This craft also is a source of interest to persons concerned with the avocational or leisure phase of living.

This course will provide students with an insight into the manufacture of clay objects as well as develop some basic skill in the manipulation and forming operations in clay.

### Course Content

What the student should be able to:

| Do | Know |
|---|---|
| | 1. Meaning of ceramics - historical background. |
| | 2. Brief history of pottery. |
| | 3. How to test for good clay. |
| 4. Wedge clay in preparation for use. | 4. How to prepare clay for use. |
| 5. Find pictures or samples of the various clay wares. | 5. How clay wares differ:<br>(a) earthen ware<br>(b) stoneware<br>(c) china<br>(d) porcelain |
| 6. Make an article using each of these methods.<br>(a) Coil<br>(b) Propped-up slab<br>(c) Draped slab<br>(d) Slab on cylinder with handle and spout<br>(e) Slab on mould<br>(f) Container with lid<br>(g) Form object on potter's wheel. | 6. How to form clay. |

7. Basic ingredients of glaze.

8. Meaning of: opaque
transparent
matt
In reference to glazes.

9. Experiment with different types of decoration.
   (a) Impressed design
   (b) Inused design
   (c) Modeled design
   (d) Underglaze design
   (e) Multi-glaze effects

9. Different methods of applying glaze.

10. How to stack a kiln for firing.

11. The use of cones in firing.

12. Make a slip mold.

12. How to cast from a mold.

13. How jiggers and templates are used commercially.

14. Where ceramic centers are located in Alberta.

15. The manufacture of brick and tile.

16. Modern ceramics manufacturing processes.

17. Occupational opportunities.

# D. LAPIDARY

## Introduction

The advantages of a study of lapidary are many. The lapidary art is one of the oldest in the world and mention is made of the cutting of stones in the Bible. The course should give the student an appreciation of the world around him with particular emphasis on the various types, colours, etc., of rocks. Included is a study of rocks, their hardness, types used for architecture and interior decoration. Interest aroused in archeology and ancient times may well motivate a student in his work in social studies.

In learning about rocks and how and where the different types are found, interest should be stimulated in geography and geology.

## Objectives

1. To learn to shape and fit specific stones to specific mounts.

2. An appreciation for the beauty of natural stones.

## Course Content

What the student should be able to:

| Do | Know |
|---|---|
| 1. Use machines properly. | 1. Operate and care for machines. (e.g. correct speeds for each operation) |
| 2. Slab rock. | 2. Proper thickness for various sizes of stones. Know how to make appropriate settings on saw. How to tighten vice so rock is secure. Proper weights to be used on machine for slabbing. Cut different way for variety of patterns. Know how to orient rocks, (e.g. tigereye). |
| 3. Lay out pattern. | 3. The different sizes of mounts available. Know how to choose correct pattern. Know which template to use. |

| Do | Know |
| --- | --- |
| 4. Mark pattern. | 4. Type of pencil used and reason for using this type. How to hold pencil correctly. Know importance of sharp pencil. |
| 5. Trim out cabs and trim saw. | 5. Proper method of trimming. Know distance to leave between cutting line and cab. |
| 6. Shape cab to fit mount. | 6. How to dress and balance grinding wheels. Amount of water to use on wheels. Know how to choose proper grit size for proper stones. Know correct angles for holding rock for grinding.<br>Know also how to choose proper contour for stone. |
| 7. Dop stone. | 7. How to prepare wax and stick for dopping. How to choose correct size of stick. |
| 8. Sand stone. | 8. Amount of water to use if wet sanding. Know correct method of sanding. |
| 9. Polish stone. | 9. Different methods of polishing and different polishing compounds used.<br>(a) cerium oxide<br>(b) linde<br>(c) chrome oxide<br>(d) tin oxide<br><br>Know also the different materials used in polishing<br>(a) felt<br>(b) leather<br>(c) maple wood |
| 10. Set stone. | 10. How to set stone. Proper tool used. Importance of correct bezel. |

## E. ART METAL

### Introduction

This unit in art metal gives students an opportunity to become familiar with various metals; to develop an appreciation of safe practices in metal work and provides activities where they can use their initiative, experiment, express creativeness and develop a sense of pride in individual accomplishment.

### Course Content

What the student should be able to:

| Do | Know |
|---|---|
| | 1. Early history of art metal trades. |
| 2. Identify non-ferrous metals. | 2. Metals used:<br>- aluminum<br>- brass<br>- bronze<br>- copper<br>- monel<br>- nickel silver<br>- sterling silver<br>- pewter<br>- zinc based alloys<br>- stainless steel |
| 3. Design a project. | 3. Design in art metal. |
| 4. Use scriber, punches, dividers, sheet metal gauge. | 4. Layout procedures and tools. |
| 5. Use the hacksaw, saber saw, snips, drills, punches, files. | 5. Methods of cutting, drilling, punching, filing. |
| 6. Anneal copper or aluminum. | 6. How to anneal and pickle metal. |
| 7. Do practice jobs in bending, twisting, beating down and raising. This could be part of a single project. (If equipment is available do a metal spinning project.) | 7. How to shape art metals by<br>- bending<br>- twisting<br>- beating down<br>- raising<br>- spinning |

| Do | Know |
| --- | --- |
| 8. Decorate small sample pieces of metal 2" x 2" illustrating various decorating techniques. Apply one of these to a project. | 8. How to decorate metal.<br>- planishing<br>- fluting<br>- doming<br>- chasing<br>- spotting<br>- stamping |
| 9. Experiment with various fastening methods and compare strength of joints.<br>- soft solder<br>- hard solder<br>- epony adhesives | 9. How to fasten art metal parts by<br>- soldering<br>- riveting<br>- cementing |
| 10. Prepare a design and etch into metal. | 10. How to etch metal.<br>- type of etching<br>- line etching<br>- area etching |
| 11. Use buffing wheel with various abrasives. | 11. How to finish metal projects by<br>- brush finishes<br>- buffing |
| 12. Discover which tradesman in Alberta use the skills of the art metal trade. | |

References

Wood

1. Groneman, Chris H., General Woodworking, Canadian Edition, 1965, McGraw-Hill

2. Feirer, John L., Industrial Arts Woodworking, 1965, Chas. A. Bennett Co.

3. Feirer, John L., Advanced Woodwork and Furniture Making, 1963, Chas A. Bennett Company

4. Miller, Hand and Machine Woodwork, 1962, Macmillan

5. Lair, E. A., Carpentry for the Building Trades, 1953, McGraw-Hill

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1. John R. Walker, Modern Metalworking, 1964

2. Fraser and Bedell, General Metal, 1962, Prentice-Hall of Canada

3. Fundamentals of Machine Shop, Sturi

4. Sheet Metals Principles, Sturi

5. Industrial Arts for General Shop, Olson

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7. Machine Shop Training, Krar A. Amand, 1962, McGraw Hill Co. of Canada Ltd.

8. Machine Shop Theory and Practice, Hallet, 1961, Macmillan Co. of Canada

9. Workshop Technology, Chapman, 1961, Edward Arnold Ltd.

10. How to Run a Shaper.
How to Run a Lathe.
How to Run a Milling Machine.
South Bend Lathe Works, South Bend 22, Indiana, U.S.A.

11. Arc Welding Lesson - Lincoln Arc Welding Foundation.

12. Welding Help for Farmers - Lincoln Arc Welding Foundation.

13. Procedure Handbook of Arc Welding Design and Practice - Lincoln. Arc Welding Foundation.

14. Forging and Welding - Robert E. Smith - McKnight and McKnight.

15. Modern Welding Practice - Althouse and Turnquist - Goodhead-Wilcox Publisher.

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1. C.I.L. Publications handled by United Plastics Limited.

2. Swanson, Plastics, McKnight and McKnight.

3. Cherry, Raymond, General Plastics, 3rd Edition, McKnight & McKnight.

4. Groneman, Chris H., Plastics Made Practical, Bruce Publishing Company.

5. Steele, Gerald L., Fiberglass Projects and Procedures, McKnight & McKnight.

6. Lappin, Alvin R., Plastics Projects and Techniques, McKnight & McKnight.

Ceramics

1. Roy, Ceramics, McGraw-Hill

2. Mitchell, Ceramics Stone Age to Space Age, National Science Teachers Association, 1201 - 16 Street, N.W., Washington 6, D.C.,1965, 50 cents.

3. Thompson, Selley, Activities in Ceramics

Leather

1. Cherry Raymond, General Leathercraft, General Publishing Co.

2. Zimmerman, Leathercraft, Goodheart-Willcox Co. Inc.

3. Groneman, Leathercraft, Charles A. Bennett Co. Inc.

4. Al Stahlman, How to Carve Leather, Tandy

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1. C. Vernon Siegner, Art Metals, General Publishing Company

2. Fraser-Bedell, General Metal, 1962, Prentice-Hall

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1. Duke, H.C., The Art Of Gem Cutting, Minerologist Publishing Company
Portland 14, Oregon - $2.00

2. O'Brien, How To Cut Gems, 1116 North Wilcox Avenue, Hollywood 38 - $1.10

3. Sinkankas, Gem Cutting, D. Van Norstrand Co., Inc.
Princeton, New Jersey $13.00

Textiles 'Fiber to Fabric, Potter and Corban
Fabrics, Denny
Experiences with Clothing,, L. Belle Pollard
Sew a Fine Seam, Wilson
Singer Manual
Butterick or McCall's Sewing Book.

MATERIALS 10

Suppliers

Wood

1. Fyfe Smith Hardwoods Limited,
Calgary or Edmonton.

Metal

1. Hector's, Calgary and Edmonton

2. Wilkinson Co.,
7025 - 103 Street, Edmonton

3. Winnipeg Brass Co., Winnipeg, Manitoba.

Plastics

1. Cope Plastics Illinois, Inc.
   Highway 100
   Godfrey, Illinois

2. Crystal Glass & Plastics, Ltd.
   130 Queen's Quay at Jarvis St. - (Dist. for Plexiglass)
   Toronto, Ontario

3. Kidder Manufacturing Co.
   75 Crockford Blvd.
   Scarborough, Ontario

4. Lewiscraft
   284 King St. West
   Toronto 2B, Ontario.

5. Natcol Plastics
   P.O. Box 299
   Redlands, California 92374

6. Taylor Plastics Ltd.
   733-735 10th Ave.S.W.
   Calgary, Alberta - (Dist. for Perspex)

7. The Castolite Co.
   Woodstock, Illinois

8. United Plastics Ltd.
   9531 - 111 Avenue - (Dist. for C.I.L.)
   Edmonton, Alberta

9. Warehoused Plastics Sales
   571 Gerrard St. East
   Toronto 8, Ontario

Ceramics

Plugged Clay - Sunburst Ceramics,
Medicine Hat, Alberta.

Plainsman Clays, P.O. Box 15,
Medicine Hat, Alberta.

Chemicals and Supplies - Alberta Ceramic Supplies,
8520 - 67th Avenue,
Edmonton, Alberta.

The Pottery Supply House,
Box 192,
Oakville, Ontario.

Leather

Tandy Leather Co.,
519 Centre St. S.
Calgary, Alberta

or

9757 Jasper Avenue,
Edmonton, Alberta.

Textiles - Local Stores
Textiles - Patons and Baldwin - Wool
Better Business Bureau pamphlets
"A Good Buy Practice", Household Finance Booklet on Money Management and clothing budgets
Classroom Aids for Teachers (Free and up-to-date information)

MATERIALS 10

Equipment

See equipment lists as below:

Plastics

Tools and Equipment

1. Woodworking hand saws.
2. Woodworking layout equipment.
3. Assorted files.
4. Common woodworking power tools.
5. Oven.
6. Buffs.

Textiles — Sewing machines, stoves, washer.
Pressing Equipment, irons, ironing boards, etc.

Small equipment found in most Home Ec. rooms
Cotton Science kit .... $25.00

## FILMSTRIPS AND FILMS

Metals

McGraw Hill of Canada Limited, 253 Spadina Road, Toronto - Filmstrips
Jim Handy General Films Limited, 1534 Thirteenth Avenue, Regina
Canadian Copper and Brass Development Association, Room 1101, 55 Yonge Street, Toronto
Aluminum Company of Canada, Department of Information, 1700 Sun Life Bldg., Montreal 2,P.Q.
Tempil, Basic Guide to Ferrous Metalurgy (Chant), from Weldco Welding Supplies, Montreal, Toronto, Quebec.

Filmstrips - Learning Farm Welding with the Arc Welds - Lincoln Welding Foundation

- Always on the Job - 20 min filmstrip with record - Air Reduction

- Industrial Gases & Shield Arc Welding - 27 min. colour-sound - Air Reduction

- Nothing But the Best - 20 min. color-sound - Air Reduction

- Tools of Many Uses - 18 min. color-sound - Air Reduction

Movie - Fundamentals of Manual Shielded Arc Welding Techniques - 2 - 20 min. reels color-sound - Air Reduction

Welding Charts - Lincoln Arc Welding Foundation, 180 Duke St., Toronto

Welding & Cutting Manual - Linde Company of Canada, Division of Union Carbide Company of Canada, 30 East - 42 Street,

Charts, booklets, etc. - Canadian Welding Bureau, 1393 Yonge Street, Toronto 7, Ontario.

# INDUSTRIAL ARTS MATERIALS 20

## Introduction

A study of materials and the use to which they are put is important if our nation is to compete with others in the development of our own resources.

This second course in Industrial Arts Materials will continue with the study of four different materials under the same headings as used in Industrial Arts Materials 10. New content is covered and the activities provide the student with new experiences.

## WOOD TECHNOLOGY

### Course Content:

What the student should be able to:

| Do | Know |
|---|---|
| **Planning** | |
| 1. Evaluate pre-selected project against principles of good design. | 1. Principles of design<br>(a) purpose<br>(b) material<br>(c) construction<br>(d) fitness<br>(e) proportion<br>(f) harmony |
| 2. Read blueprint exercises. | 2. Good planning procedures.<br>(a) reading blueprints<br>(b) use of bill of materials<br>(c) figuring material<br>- board feet<br>- lineal feet<br>- square feet |
| 3. Make a bill of materials for project. | |
| 4. Plan out steps in the procedure for making the project. | |

## Materials

| | |
|---|---|
| 5. Make reports on the production of imported woods. Note<br>- climatic conditions<br>- lumbering<br>- transportation | 5. How to identify and the characteristics of<br>- teak - true<br>- teak - African<br>- cherry<br>- satin walnut<br>- bird's eye maple |

## Hand Processes

| | |
|---|---|
| 6. Prepare jig and bend wood for small project. | 6. How to bend solid wood. |
| 7. Make small project from laminated wood (salad fork) | 7. How to laminate wood. |
| | 8. Use of special hand tools<br>- cabinet maker's rabbet plane<br>- bull nose plane |
| 9. Cut, match and lay veneer using knife and veneer saw. | 9. How to do veneering<br>- plain<br>- crotch |

## Machine Processes

| Do | Know |
|---|---|
| 10. Use the table saw to cut dados, grooves, bevels. | 10. How to use and maintain power tools safely and correctly.<br>- table saw<br>- router<br>- jointer<br>- lathe |
| 11. Use the jointer to cut chamfers, bevels and rabbets. | |
| 12. Use the router to decorate an edge. | |
| 13. Use the lathe to turn a spindle or bowl-type project. | |

## Fasteners

| | |
|---|---|
| 14. Find examples of different styles of cabinet hardware. | 14. Hardware items:<br>- hinges - types<br>- catcher<br>- handles |
| 15. Make tests of various glues for strength and water resistance. | 15. Use of synthetic glues. |

## Finishing

| | |
|---|---|
| 16. Finish a project using one of the materials suggested. | 16. Finishing methods<br>- stain<br>- fillers<br>- shellac<br>- lacquer<br>- varnish<br>- Swedish oil<br>- polishing with rubbing oil<br>- polishing with steel wool<br>- polishing with pumice powder and rotten stone. |
| 17. Clean and store a paint brush. | 17. Care and storage of paint brushes. |

## Occupational Opportunities

| | |
|---|---|
| 18. Make a list of the occupational titles dealing with the wood industry. | 18. Occupational opportunities in the wood industries. |

## Metal

Course Content:

What the student should be able to:

| Do | Know |
|---|---|
| | 1. Standard metal symbols. |
| 2. Design a metal truss to carry a roof. | 2. Suitability of design and material for industrial purposes. |

| Do | Know |
|---|---|
| **Hand Processes** | |
| 3. Cut a piece of octagonal tool steel and shape into the form of a cold chisel by forging, annealing and filing or by using the emery wheel. | 3. The metalurgy of carbon steel, ferrite, mild steel, perlite, cementite. Importance of .9% carbon content. The carbon graph relating perlite to ferrite and cementite and U.T.S. Hardness and Ductility to the carbon content. |
| 4. Heat cold chisel to above critical range and quench. | 4. Hardening<br>Critical Temperatures<br>Point of Decalescence and Recalescence<br>Associated Phenomenal, Cenation of temperature rise, contraction and loss of magnetic attraction and great plasticity.<br>Action taking place in the metal<br>Industrial Uses<br>Graph to show decreasing critical range or carbon content increases to .9% |
| 5. Heat a piece of polished steel very gradually along its length to show oxides in broad bands from blue to light straw. Temper by blacksmith's method. Heat to red heat, quench tip, clean with wet stone, watch heat run back to tip. When correct oxide shows quench whole job. | 5. The heat treatment furnace<br>Segar cones<br>Determining heat range by oxide colors<br>Effects of tempering upon the constitution of the steel<br>Austentite, Martensite |
| 6. Soften chisel and reharden and temper. | 6. Annealing, tempering and normalizing.<br>How to quench without distortion. |
| **Machine Processes** | |
| 7. Grind a variety of steels and watch sparks carefully. | 7. The characteristic sparks given off by various steels. |
| 8. Mount H.R. stock in Universal Chuck. | 8. Parts, care and use of lathe. |
| | 9. Safety to machine and students. |

| Do | Know |
| --- | --- |
| 10. Surface end of rod and machine projecting part. Reverse and repeat above. | 10. Setting cutters. |
| | 11. Cutting speeds. |
| | 12. Using saddle lock and micrometer roller of compound slide rest.<br>The inaccuracy of a Universal Chuck. |
| 13. Remount work in Independent Chuck machine and reverse as above. | 13. The independent chuck.<br>Its greater accuracy. |
| 14. Center drill both ends. | 14. Combination drill and countersink and its use.<br>- Mounting a Jacob's chuck in the tail stock.<br>- Drilling in the lathe. |
| 15. Mount between center and rough turn. | 15. Types of dogs.<br>Drive plate.<br>Using callipers to establish size. |
| 16. Finish turn to size. | 16. The micrometer and how to use it.<br>Use of lubricant.<br>Bringing a job down to an accurate size using the micrometer roller on the transverse feed. |
| 17. Cut a shoulder. | 17. Use of the right hand cutter.<br>Marking off with hermaphrodite callipers.<br>Measuring on the lathe. |
| 18. Machine flat surface to a fine finish. | 18. The shaper.<br>Safety to machine and student.<br>Set up for stroke, speed, feed table height.<br>Types of cutters.<br>Angles of clapper box.<br>Mount work in vise parallel to horizontal movement of cutter.<br>Feeds and cutters for coarse and fine work.<br>Work to a coarse finish.<br>Work to a fine finish. |

| Do | Know |
|---|---|
| 19. Machine an angle to the above finished surface. | 19. Set the vertical feed to angle of the slope and machine using hand feed. |
| **Finishing** | |
| 20. Finish metal with hammer-tone spray can. | 20. Types of finishes<br>- industrial finishes<br>- spraying<br>- spray bombs |
| **Occupational Opportunities** | |
| 21. Study occupational opportunities in the field of machinists. | 21. Occupational opportunities of machine operators. |
| 22. Compare various makes of welders. | 22. The basic types of AC and DC generators. |
| | 23. The action of the arc in depositing metal. |
| 24. Test the effects of straight and reverse polarity with different types of rods. | 24. AC - DC straight and reverse polarity welding. |
| | 25. The industrial implications of arc welding and its increase in the last few years. |
| | 26. Classification and color coding of electrodes for various welding operations. |
| 27. Set up equipment for welding. Select holders, adjust machine. | 27. How to set up welding equipment. |
| | 28. Correct heat and arc length for varying rods and conditions. |
| 29. Strike an arc and run a bead. | 29. How to hold an electrode, strike an arc and run a bead |
| 30. Join two pieces of metal in horizontal position. Butt, lap and tee. | 30. Techniques of making a good weld. |
| 31. Practice a vertical and overhead weld. | 31. Problems to consider in various types of welds, metals, strength required, accessibility. |
| 32. Make a concentrated study of an area, e.g. the farm and list all the applications of welding. | 32. Applications of welding to home, farm and industry. |
| | 33. Occupational problems of welders. |

# PLASTICS

## Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Design and Layout** | |
| 1. Interpret intermediate drawings. | 1. Design - its application to projects in plastics. |
| **Hand Processes** | |
| 2. Plan projects for heat forming. | 2. Plastics that can be heat formed. |
| 3. Free form plastics. | 3. (a) Types of plastic heating equipment<br>(b) Procedures for heat forming |
| 4. Construct molds for forming. | 4. (a) Types of molds for heat forming<br>(b) Techniques of mold construction |
| 5. Mold form heated plastics. | 5. Procedures for mold forming. |
| 6. Strip heat and form. | 6. Procedures for strip heating. |
| 7. Join plastics by heat. | 7. Methods of welding plastics by heat. |
| 8. Heat laminate plastics. | 8. (a) Methods and procedures for heat laminating.<br>(b) Care of heating equipment. |
| **Machine Processes** | |
| 9. Blow Form. | 9. (a) Materials used for forming.<br>(b) Types and differences of plastic forming equipment.<br>(c) Procedures for blow forming. |

| Do | Know |
| --- | --- |
| 10. Vacuum Form. | 10. Procedures for vacuum forming. |
| 11. Experiment and run tests with forming and molding. | 11. Safe procedures for experimenting with and testing of plastics. |

Projects

1. Picture frames
2. Bracelets
3. Candle holders
4. Cigarette boxes
5. Jewelry boxes
6. Dishes
7. Pen bases
8. Paper weights
9. Letter holders
10. Buttons

Tools and Equipment

1. Basic tool list for hand processes.
2. Strip heater.
3. Vacuum forming equipment.
4. Blow forming equipment.
5. Heat laminating press.
6. Assorted molds.

References

Wood

1. Groneman, Chris H., General Woodworking, Canadian Edition, 1965, McGraw-Hill

2. Feirer, John L., Industrial Arts Woodworking, 1965, Chas. A. Bennett Co.

3. Feirer, John L., Advanced Woodwork and Furniture Making, 1963, Chas A. Bennet Company

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1. John R. Walker, Modern Metalworking, 1964

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3. Fundamentals of Machine Shop, Sturi

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11. Arc Welding Lesson - Lincoln Arc Welding Foundation

12. Welding Help for Farmers - Lincoln Arc Welding Foundation

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1. Roy, Ceramics, McGraw-Hill

2. Mitchell, Ceramics Stone Age to Space Age, National Science Teachers Association, 1201 - 16 Street, N.W., Washington 6, D.C., 1965, 50 cents

3. Thompson, Selley, Activities in Ceramics

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1. Cherry Raymond, General Leathercraft, General Publishing Co.

2. Zimmerman, Leathercraft, Goodheart-Willcox Co. Inc.

3. Groneman, Leathercraft, Charles A. Bennett Co. Inc.

4. Al Stahlman, How to Carve Leather, Tandy

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1. C. Vernon Siegner, Art Metals, General Publishing Company

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2. O'Brien, How to Cut Gems, 1116 North Wilcox Avenue, Hollywood 38 - $1.10

3. Sinkankas, Gem Cutting, D. Van Norstrand Co., Inc. Princeton, New Jersey $13.00

Textiles Fiber to Fabric, Potter and Corban
Fabrics, Denny
Experiences with Clothing, L. Belle Pollard
Sew a Fine Seam, Wilson
Singer Manual
Butterick or McCall's Sewing Book.

# INDUSTRIAL ARTS MATERIALS 30

## Introduction

Industrial Arts Materials 30 the third and last course in the materials series provides students with advanced techniques and procedures in the use and testing of materials.

Students should be encouraged to study the actual working conditions of men in the industries represented so that they become aware of the need for skilful, accurate and precise workmanship. They should know about the organization of industry from the unskilled laborer to the manager or president. They should understand what industry expects of them in the matter of personality, habits, dependability and reliability. Students should be aware of the complexity of productive society and what this means to them.

## Wood Technology

### Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Layout and Design** | |
| 1. Do exercise requiring the reading of building plans. | 1. How to read architectural symbols and lines. |
| 2. Develop the organization of a company. | 2. How buildings are planned.<br>- responsibilities of architect<br>- responsibilities of draftsman<br>- financing problems<br>- building costs<br>- job opportunities in drafting and architecture. |
| 3. Choose a location and perform the actions of purchasing a lot. | 3. How to choose a site<br>- securing a lot<br>- what makes a suitable location<br>- zoning laws |

| Do | Know |
| --- | --- |
| 4. Write out a list of steps to follow in the order a building would be completed. | 4. How to plan the construction.<br>- purchase of materials<br>- use of sub-trades |
| 4. Use transit or tape and level to square and level footing forms. (one side only) | 5. How to layout a footing. |
| 6. Mix small concrete sample. | 6. Basic form design - concrete |
| 7. Cut floor members:<br>- joists and headers<br>- bracing<br>- subfloor | 7. Parts of a floor<br>- types of sills<br>- names of members<br>- use portable hand saw |
| 8. Frame a wall with<br>- door<br>- window | 8. Wall framing<br>- doors<br>- windows<br>- nailing |
| 9. Place ceiling joists<br>- mark carefully in relation to rafters. | 9. How to mark for ceiling joists. |
| 10. Cut a rafter | 10. How to cut a common rafter. (use a framing square) |
| 11. Nail rafter. | 11. How to nail rafters properly. |
| 12. Nail sheathing - wall<br>- roof | 12. Sheathing types - placement<br>- nailing |
| 13. Describe samples of various exterior finishing materials used in construction. | 13. Exterior building finishes. |
| 14. How to lay shingles. | 14. How to cover a roof<br>- types of coverings |
| 15. Complete portion of wall with drywall, tape and fill. | 15. How to finish the interior of a house.<br>- types of finishes<br>- plaster<br>- drywall tips<br>- wood panelling |

| Do | Know |
|---|---|
| 16. Study examples of different finishing jobs. Make a list of things to watch for which indicate good craftsmanship. | 16. How to do finish carpentry<br>- hanging a door<br>- baseboards<br>- moldings |
| 17. Sharpen - a plane<br>- a chisel<br>- a gouge<br>- lathe chisels | 17. How to condition tools<br>- sharpen<br>- adjust |
| 18. Check general condition of machine tools.<br>- bearings<br>- belts and pulleys<br>- adjustments | |
| 19. Find samples of materials of different grades. | 19. Grading of Canadian construction woods. |
| 20. Interview a construction contractor to discover<br>- type of training he wants for his employees, skills required<br>- working conditions<br>- job security<br>- how to apprentice<br>- pay rates<br>- how to join a union<br>- how Workman's Compensation functions | 20. Occupational information. |
| 21. Make several trusses (own design) and test strength. | 21. Methods of trussing - design<br>- material |

## Metal

Course Content

What the student should be able to:

| DO | KNOW |
|---|---|
| **Layout and Design** | |
| 1. Design small project for mass production. | 1. How to design material and construction, relate in mass production. |

| Do | Know |
|---|---|
| **Materials** | |
| 2. Break, stretch, bend, contre, punch, hammer and break by tension, shearing, twisting and by bending back and forth. | 2. The terms used to describe the properties of metals. Brittleness, ductility, elasticity, elongation, hardness, toughness, malleability. V.T.S., shear torsion. |
| 3. Simple demonstration of the determination of tensile strength, hardness, elastic limit, impact resistance, fatigue, endurance limit. | 3. The way tensile strength and elongation is determined. Brinell and Rockwell hardness testers and numbers. Note the effect on sinking and filing up on work hardening characteristics. Izod and charpy impact tests Bend and cupping tests and their special importance to fabricators of sheet metal. |
| **Hand Processes** | |
| 4. Case harden a piece of mild steel using carbon granules. | 4. Case hardening technology. Different methods. |
| 5. Hammer a piece of soft copper. Note hardness, heat to dull red, allow to cool or quench. Note softness. | 5. Work hardening and its advantages and disadvantages in industry. |
| 6. Polish and examine hard and soft pieces of the metal. | 6. The non-ferrous metal industry, its importance and distribution. The production of copper from ore to metal and its uses. |
| 7. Work and polish a piece of aluminum. | 7. The production of aluminum from bauxite to metal and its uses. |
| 8. Examine zinc, lead, tin, nickel, silver. | 8. How these metals are mined and produced and their importance as elemental metals. |

| Do | Know |
|---|---|
| 9. Grind a piece of high speed tool steel and a piece of carbon steel in the form of a cold chisel causing the tip to glow red in the process and allow to cool slowly.<br>Chisel a piece of mild steel.<br>Take a very fast cut in the lathe and note the effect on HSS and carbon steel cutters.<br>Wet a piece of stainless and mild steel and leave overnight. | 9. Alloys of steel, their advantages and immense importance today.<br>Some of the more important alloys and their uses. |
| 10. Test non ferrous metals<br>- copper<br>- aluminum | 10. Non-ferrous metal industry. |
| | 11. Mining and production of these metals. |
| | 12. Importance of these metals. |
| 13. Make joints with hard and soft solder. | 13. Melting points of lead tin solders - graph showing varying plasticity with increasing percentage of lead. |
| 14. Spot welding. | 14. Techniques of spot welding. |
| Machine Processes | |
| 15. Cut a morse taper with lathe. | 15. Offset and re-align tail stock. Methods of calculating offset. Use sleeve and marking ink or chalk to obtain an accurate taper.<br>Use compound slide rest to cut a taper by setting to a calculated angle.<br>Use taper attachment. |
| 16. Cut a groove. | 16. Use end-cutting tool<br>Parting-off tool<br>Prevent chatter. |
| 17. Turn other metals. | 17. Effects of speeds, cutters and lubricants. |

| Do | Know |
|---|---|
| 18. Cut 5/16" square mild steel and grind a set of cutters. | 18. The grinding wheel. Danger to eyes and fingers. Use without making hollows on wheel. Shapes and angles of lathe cutters. |
| 19. Machine a flat surface. | 19. How to use the milling machine. Safety to machine and student. Mount plain mill on arbor and fit in machine. Set for speed, feed and direction. Mount job in vise. Set mill to correct height and make a rough and finish cut. |
| 20. Machine side of block in position above. | 20. Mount a side mill and adjust machine for cut. |
| **Finishes** | |
| 21. Knurling. | 21. Mount knurl, need for rigidity Lathe speed How a knurling tool works. |
| 22. File in the lathe. | 22. Safe use of file in the lathe. Prevent pinning. |
| 23. Polish. | 23. Safe use of emery cloth and oil in the lathe. |
| **Acetylene Welding** | |
| Do | Know |
| 24. Examine diagrams of welding equipment, tips and cutting torch. | 24. History of welding. |
| | 25. The tremendous effect of welding and its techniques upon industry. |
| | 26. Methods of making and storing Acetylene and oxygen, old and new. Cylinders, regulators and torches. |

| Do | Know |
| --- | --- |
| 27. Study oxy-acetylene outfit. | 27. The great dangers associated with oxygen and acetylene. |
| 28. Light a torch. | 28. How to adjust pressure to get neutral, oxydizing and carbonizing flames and their uses. |
| 29. Join two pieces of 1/8" mild steel. | 29. Different methods of preparing the base metals. |
| 30. Make a number of welds, horizontal and vertical. Repair students broken equipment where possible. | 30. Welding methods. The torchad or puddle weld. |
| 31. Break the weld. | 31. Difficulties of full penetration. |
| | 32. The main uses of oxy-acetylene welding in industry. Pipe lines, etc. |
| 33. Cut steel using cutting torch. | 33. How to use the cutting torch.<br>Cutting with pure oxygen.<br>Cutting machines used in industry,<br>Pontograph and electronic tracer.<br>Cutting cast iron and other metals.<br>The oxygen lance. |
| 34. Braze weld a casting. | 34. The technique of braze welding. |
| 35. Braze together two steel parts. | 35. How capilliary attraction is used to distribute brass in brazing. |
| 36. Silver solder two pieces of metal together. | |
| | 37. Uses in industry.<br>Fluxes required. |

## Plastics

### Course Content

What the student should be able to:

| Do | Know |
|---|---|
| **Layout and Design** | |
| 1. Read advanced plans. | 1. Reasons and applications of design. |
| 2. Plan and choose projects using resins. | 2. (a) Source and production of resins<br>(b) Production of fiberglass. |
| 3. Plan and choose projects for machine processes. | 3. Plastics and procedures used in machine processes. |
| **Materials and Hand Processes** | |
| 4. Prepare specimens for embedding. | 4. Preparation of specimens for embedding. |
| 5. Embed in resins. | 5. (a) Resins used for embedding<br>(b) Methods of embedding in resins. |
| 6. Overlay with resins | 6. (a) Purposes and materials for overlay<br>(b) Methods of overlay. |
| 7. Flat laminate with fiber glass and resin. | 7. (a) Materials used in laminating<br>(b) Application of fiber glass. |
| 8. Mold form with fiber glass and resin. | 8. Types and requirements of molds used with fiber glass. |
| 9. Repair fiber glass. | 9. Procedures of fiber glass repair. |
| 10. Experiment and run tests with projects of fiber glass and resins. | 10. Safe procedures in working with fiber glass and liquid resins. |

## Machine Processes

| | |
|---|---|
| 11. Surface carve. | 11. (a) Types of equipment used for carving.<br>(b) Methods of surface carving. |
| 12. Internal carve. | 12. Procedures for internal carving. |
| 13. Rotational mold. | 13. (a) Types and differences of plastic molding equipment.<br>(b) Materials used for molding.<br>(c) Rotational molding procedures. |
| 14. Slush mold. | 14. Slush molding procedures. |
| 15. Injection mold. | 15. Injection molding procedures. |
| 16. Extrusion mold. | 16. Extrusion molding procedures. |
| 17. Compression mold. | 17. Compression molding procedures. |
| 18. Transfer mold. | 18. Transfer molding procedures. |
| 19. Experiment and run tests with machine processes. | |
| | 20. Safe procedures for working with plastic molding equipment. |

## Finishing

| | |
|---|---|
| 21. Color resins. | 21. Pigments and their application. |

## Occupational Opportunities

| | |
|---|---|
| 22. Study a plastics manufacturing plant for occupational information. | 22. Occupations available in the plastics industry. |

Projects

1. Paper weights
2. Zipper pulls
3. Book ends
4. Bag pulls
5. Pictures
6. Plaques
7. Blind pulls
8. Keychain ornaments
9. Picture frames
10. Letter openers
11. Candle holders
12. Dishes
13. Lamps
14. Boxes
15. Water skis
16. Lampshades
17. Waste paper baskets
18. Pen bases
19. Placematts
20. Dress clips
21. Jewelry
22. Tie tacks
23. Dishes and trays

Tools and Equipment

1. Carving motor, shaft and head
2. Assorted burrs and tapered drills
3. Rotational mold
4. Slush mold
5. Injection mold
6. Transfer mold
7. Compression mold
8. Extrusion mold
9. Porcelain molds
10. Asserted glass dishes for molds
11. Fiber glass molds
    (a) Male molds
    (b) Female molds
    (c) Matched molds
12. Mylar sheet

# MATERIALS 30

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